REMARKS

Applicants have carefully reviewed the contents of the Office Action mailed December 26, 2002. Reconsideration is respectfully requested in view of the foregoing amendments and the comments set forth below.

By this Amendment, claims 31, 35, 57-58 and 62 are amended, the specification and drawings are revised to overcome the Examiner's objections. Independent claim 31, as well as claims 32-36, is generic to the embodiments shown in all the figures, and at least claims 53-58 read on the elected species shown in Fig. 25. Accordingly claims 31-62 are pending in the instant application, with at least claims 31-36 and 53-58 directed to the elected species.

Claims 57 and 58 have been amended to recite the "at least two constructive elements" so that the claims clearly read on elected Fig. 25 that shows "at least two constructive elements" 2, 3, as noted in the Office Action.

The Examiner objected to the drawings because the reference character "10" had been used to designate both a round sleeve in Fig. 26 and an oval sleeve in Fig. 27. This is true: however, the round sleeve 10 in Fig. 26 is in its relaxed state and the oval sleeve in Fig. 27 is the same sleeve as shown in Fig. 26, except the oval sleeve is in its pre-tensioned state. This is explained on page 14, line 32 through page 15, line 2; page 18, lines 7-17 and page 19, lines 3-7 of the instant specification. Thus, reference character 10 denotes the same sleeve in its 3 states: relaxed; pre-tensioned and partially relaxed. Since 37 C.F.R. 1.84 (p) (4) states that the "same

part of an invention appearing in more than one view of the drawings must always be designated by the same reference character", it is respectfully submitted that the sleeve is correctly designated as reference character 10 in Figures 12-14, 15-16, 18-21 and 26-29.

It is noted that Figures 22-25 illustrate a different embodiment with a clamping sleeve 10'. This clamping sleeve 10' is oval in cross-section in the relaxed state and circular in cross-section in the pre-tensioned state. This is described in the paragraph spanning page 18, lines 20-31 of the instant specification. Likewise, Figures 30-33 show another embodiment of the invention as described on page 19, lines 11-24 of the instant specification. The clamping sleeve of this embodiment is indicated by 10" in Figures 30-33.

With respect to reference character "2" that designates a constructive element, the Examiner is correct in that there are three different embodiments of such a constructive element. Figure 28 has been revised designating the rectangular constructive element as "2"' and "3"'. Similarly, the oval part of the constructive element shown in Fig. 20 is designated "2"". Since Fig. 21 shows a longitudinal section of Fig. 20, the "bulge part" of constructive elements 2 and 3 is designated "2"" and "3"", respectively. In view of these drawing changes, it is believed that the drawings now comply with 37 C.F.R. 1.84.

On page 3 of the Office Action, the disclosure was objected to because of a few informalities. By the foregoing amendments to the specification, the European designation of a decimal was replaced with a period as is conventional United States. In addition, the specification was revised to refer to the new reference characters illustrated in Figs. 20-25, 28

and 30-33. Accordingly, it is submitted that the specification is in proper form and withdrawal of the objection is respectfully requested.

Claim 35 was rejected under 35 U.S.C. § 112, first paragraph as allegedly containing subject matter which was not described in the specification. It was the Action's position that when a part is expanded, no forces are applied. The Action relies upon a publication titled "Engineering Aspects of Shape Memory Alloys" by Duerig et al. and specifically the second paragraph on page 137 of that publication. While page 137 of the publication is directed to the same kind of connection which is achieved with a sleeve according to German Patent DE '307, it is directed to a different type of elastic deformation than that described and claimed by the instant application. As explained in detail on page 137 of the Duerig publication, the part is cooled to its martensitic state. This type of elastic deformation requires a part in its austenitic condition to be cooled down to its martensitic state. The martensite achieved by cooling down from the austenitic condition is called "thermal martensite". The part must be stored in the cooled martensite state until it is installed in a connection element. When the part warms up, it transforms back to austenite and upon doing so, the part shrinks and the size is reduced. As a result, pressure forces act on the elements inserted inside the shrinking part and the resulting stress forces create the joint or connection. This type of deformation is described on page 5, lines 12-29 of the instant application. It is respectfully submitted that the contracting of a sleeve when the sleeve is heated is not an elastic deformation, but a change of shape due to a phase transition of the material from the martensite to the austenite state.

Thermal martensite and its use for creating couplings is well known in the art, as described in the attached three documents: 1) Hodgson, "Shape Memory Alloys"; 2) "Fundamental Characteristics of Nickel – Titanium Shape Memory Alloy"; and 3) Wayman et al., "An Introduction to Martensite Shape Memory". This is NOT the claimed invention.

The Action further states that the "phenomena [described in "Engineering Aspects..."] is contradictory to Applicant's claim." If this was Applicants' invention, the Examiner may have a point, but the phenomena described above has nothing to do with the invention. According to the invention, the connection part (the sleeve) is not enlarged in a cooled, martensitic state, but is enlarged at room temperature when it is in an austenitic state. As explained in the paragraph spanning pages 5 and 6 of the instant application, the mechanical shaped memory effect appears when the constructive element is deformed in a certain temperature range and for this, it is energetically more favorable for the austenitic crystalline structure to convert to martensite in a tension-induced way, whereby elastic expansions of up to ten percent can be obtained. That is, the temperature is such that the constructive element is in the austenitic state (i.e., room temperature) and it is the influence of the resultant stress that converts the austenite into martensite. Thus, the instant specification clearly describes that the resultant martensite is induced by stresses, which is contrary to the thermal martensite produced by a change of temperature in accordance with the publication relied upon in the rejection under 35 U.S.C. § 112, first paragraph.

Figures 12-15 illustrate how the tension-induced or stress-induced martensite provides the holding force claimed by Applicants. Fig. 12 shows the clamping sleeve 10 in its relaxed state. Fig. 13 illustrates a tension-induced martensite sleeve, which is oval in cross-section. As explained on page 6, lines 2-3, when the clamping sleeve 10 is unloaded or released, the crystalline structure returns to the austenitic phase. This partially relaxed state is shown in Fig. 14 and since the clamping sleeve, without force, would return to its relaxed state, a holding force occurs in the partially relaxed state. According, it is respectfully submitted that the instant specification describes the instant invention in such a way as to enable one skilled in the art to make or use the invention. Withdrawal of the rejection under 35 U.S.C. § 112, first paragraph is respectfully requested.

Claims 31-36, 53-56 and 62 were rejected under 35 U.S.C. § 112, second paragraph as being indefinite for the reasons set forth on page 4 of the Action. With respect to claim 31, the limitation "nonpositive connection" in line 4 is a direct translation of the German word "kraftschlüssige Verbindung", as evidenced by the enclosed European Patent which is based on the priority document, (DE 19834305) of the instant application. The German word "kraftschlüssige" is translated as "tensionally, connected, force locking", and when combined with a verb form of "verbunden" means "frictionally connected" (see enclosed German to English Dictionary Definition). Accordingly, claim 31 has been amended replacing the term "nonpositive" with the term "frictional", as the same is a better translation of the original German word.

The Action queries whether there are other types of martensitic state. As explained above, there is the thermal martensite, which is not tension-induced or stress-induced. As explained in Document 2 ("Fundamental Characteristics of Nickel-titanium Shape Memory Alloy"), chapter 2.3.6, paragraph 1, superelasticity is based on stress-induced martensite formation. The instant specification describes the material of the tensioning element as including new material made of a superelastic shape memory alloy, which is expanded elastically (purely elastically, superelastically in the tensioning element). Thus, the claimed invention is directed to superelasticity and it is believed that the term stress-induced is the common word describing a "tension-induced" martensitic state. Accordingly claim 35 has been amended replacing the objected to "tension-induced" adjective to stress-induced as that term is generally used in the technical literature.

Page 12, lines 20-30 describes the connection of very smooth constructive elements 2,3 and states that the "it can be advantageous to increase the holding forces by increasing the friction of a section 6 of at least one constructive element to be connected. This paragraph further describes how the friction may be increased (e.g., by raising, structuring or coating a section 6 of at least one constructive element to be connected and inserted into the tensioning element or spring). Accordingly , claim 62 has been amended to clarify that the section is of the least one constructive element and it is believed that the term "friction –increased" is clear based on the description disclosed in the instant application. In view of the foregoing amendments to the claims and comments, it is respectfully submitted that claims 31-36, 53-56 and 62 are fully

definite under 35 U.S.C. § 112, second paragraph. Withdrawal of this rejection is respectfully requested.

Claims 31-32, 34, 36, 53-54, 56 and 62 are rejected under U.S.C. § 102 (b) as being anticipated by the German Patent, DE-3,007,307 (hereinafter referred to as "DE'307") as explained on pages 5-7 of the Action. This rejection is respectfully traversed.

As explained in the Amendment filed on October 29, 2002, the instant invention is directed to a connecting element for mechanically connecting constructive elements that are difficult to weld or solder together. The connecting element of the invention allows larger tolerances and dimensional deviations for the tensioning element and/or the constructive elements, but at the same time creates a strong holding force. This is achieved, as explained on page 18, lines 20-31 of the instant specification by a connecting element according to the invention which includes a clamping sleeve 10 with two constructive elements 2, 3 inserted therein. In the elected embodiment, the constructive elements are oriented with their ends facing each other. Figures 22-25 illustrate a clamping sleeve 10' in its relaxed state (Fig. 22) (which has a diameter smaller than the constructive element) and in its pre-tensioned state (Fig. 23 where its diameter is expanded to permit the constructive elements to be inserted within the sleeve.). According to the invention, in the pre-tensioned state shown in Fig. 23, constructive elements 2, 3 are inserted within the clamp and then clamping sleeve 10' is allowed to relax into a partially relaxed state as shown in Figs. 24 and 25 of the drawings. It is in this partially relaxed state

where the elastically expanded height of clamping sleeve 10' moves toward its relaxed state thereby bearing down on constructive elements 2, 3 and providing the necessary holding force.

In contrast, German Patent DE'307 is directed to a shrunk joint made of an alloy having a shape memory that has a 2-way effect. However, DE'307 discloses a shrinking sleeve that is cycled in temperature in order to be used as a connecting element. The shrinking sleeve taught by DE'307 is cooled (e.g., via liquid nitrogen) to a temperature below the martensitic conversion point so that it is elastically deformed to have a larger diameter and, as a result, parts 1 and 2 can be inserted in the connective sleeve 5, as shown in Figs. 1 and 2. Then, the assembly is warmed to a temperature above the martensitic conversion point where the connective sleeve 6 radially contracts to a smaller diameter, as shown in Fig. 3. Thus, contrary to the claimed invention, DE'307 applies its holding force in its contracted state. Accordingly, DE'307 cannot anticipate the claimed invention as it holds elements when contracted in an austenitic state. This is the opposite of the claimed connecting element.

While the rejection indicates that DE'307 has a "superelastic shaped memory alloy" relying on the English Abstract, the English Abstract of the DE'307 Patent does not use the adjective "superelastic". In the "Shape Memory Alloys" publication referred to above, it is explained in the chapter "General Characteristics" (page 2) that the martensitic transformation that occurs in the shape memory alloys yields a thermoelastic martensite. The resulting transformation versus temperature curve is shown in Figure 1. From this figure, it can be seen that changing the temperature results in (i) a change of the martensitic/austenitic content of the

alloy and (ii) a change of the length of the part. Thus, the "shrunk joint" taught by DE'307 starts from a high temperature (with 0% martensite, 100% austenite) and the size is expanded by cooling thereby changing to 0% austentite and 100% martensite. Consequently, DE'307 discloses a "thermoelastic martensite" and not a stress-induced martensite, which is achieved by elastically expanding the tensioning element. Accordingly, DE'307 does not disclose a "superelastic shaped memory alloy" as claimed by Applicants. Nor does DE'307 disclose a tensioning element which applies a holding force in an elastically expanded state onto a constructive element that is to be connected, thus generating a frictional connection between the constructive and the tensioning element, as required by independent claim 31. Consequently, DE'307 cannot anticipate the claimed invention.

Claim 33 was rejected under 35 U.S.C. § 103(a) as being unpatentable over DE'307 in view of the publication entitled "Ti-Ni Shape Memory Alloys" by Duerig et al. This rejection is respectfully traversed.

While the above publication by Duerig et al. mentions that "alloys with 49.0 to 50.7 at. % titanium are commercially common", the Duerig et al. publication does not disclose, teach or suggest a connecting element from mechanically connecting constructive elements. Nowhere does the Duerig publication disclose, teach or suggest a connecting element comprising an elastically deformable tensioning element which applies a holding force in an elastically expanded state onto a constructive element that is to be connected. Nor does the Duerig suggest that the commercially available titanium-nickel can be used in a tensioning element where a

constructive element to be connected is inserted in the axial direction of the tensioning element as claimed by Applicants. DE'307 fails to disclose these claimed features and the Duerig publication also fails to teach or suggest modifying the thermal martensite formation taught by DE'307 to a mechanical stress-induced martensite as claimed by Applicants. Accordingly, the Duerig et al. publication cannot render obvious the claimed invention.

As explained above, the claimed invention does not make use of thermal martensite, which the primary reference to DE'307 employs to provide the shrunk joint. It is respectfully submitted that the corresponding temperature cycling taught by DE'307, is a technologically different process that that of the claimed invention that makes use of another property of shape memory metals which is known in the prior art under the term "superelasticity". Page 4, line 21 of the instant specification uses the term "superelastically" and claim 31 states that the material consists of a "superelastic shape memory alloy". These terms are defined on page 5, line 31 through page 6, line 5 and page 6, line 31 through page 7 line 26 of the instant application. Accordingly, one of ordinary skill in the art would have understood the instant application as describing a mechanical, tension-induced or stress-induced formation of martensite, as opposed to the formation of thermal martensite.

It is respectfully submitted that this Amendment After Final Rejection places the application in condition for allowance, does not raise new issues (as claims 31, 35, and 62 are amended to clarify the invention), and does not raise the issue of new matter. Accordingly,

Applicants respectfully request that this Amendment After Final Rejection be entered and that this application be passed to issuance.

Accordingly, since generic claim 31 is patentable over the art of record, it is respectfully submitted that the rejoinder of claims 37-52 and 59-62 is appropriate. Accordingly, Applicants request the issuance of the Notice of Allowability rejoining all of the species invention and indicating that 31-62 are allowed over the prior art of record.

Should the Examiner believe that a conference would advance the prosecution of this application, the Examiner is requested to telephone the undersigned counsel to arrange such a conference.

Respectfully submitted,

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